

THAT WHICH IS CLAIMED IS:

1. A catheter for hemodialysis which comprises a flexible catheter tube defining a plurality of separate lumens, said catheter defining an arc angle of generally U-shape in its natural, unstressed configuration, whereby said catheter may be implanted with a distal catheter portion residing in a vein of a patient, said distal catheter portion being of substantially the shape of said vein in its natural, unstressed condition, and a proximal catheter portion residing in a surgically created tunnel extending from said vein and through the skin of the patient, whereby blood may be removed from said vein through one lumen of the catheter and blood may be returned to said vein through another lumen of the catheter.

2. The catheter of Claim 1 which defines, in its natural unstressed condition, a second arc section which bends in the dimension perpendicular to the dimension of the U-shape of said catheter.

3. The catheter of Claim 2 in which said second arc section defines an arc angle of essentially 50-90 degrees.

4. The catheter of Claim 1 which carries a spaced

pair of tissue securance cuffs along its proximal portion for implantation in said surgically-created tunnel.

5. The catheter of Claim 1 in which the pair of spaced catheter lumens terminate at distal ends in, respectively, first and second ports, said second port being positioned proximally of said first port to permit simultaneous withdrawal of blood from, and infusion of blood to said vein while minimizing recirculation of blood through the catheter.

6. A catheter for access to the vein of a patient, said catheter comprising a flexible catheter tube having at least a pair of separate lumens for respectively withdrawing blood from said vein and returning blood thereto, said catheter defining relatively straight end portions, plus a central portion which defines, in its natural, unstressed configuration a U-shaped section, plus a second, curved section connected to said U-shaped section, which second section bends in an arc which extends in the dimension perpendicular to said U-shaped section, whereby said catheter may be implanted with a distal portion thereof occupying a vein and being of substantially the shape of said vein, and a proximal portion thereof which occupies a surgically-created tunnel extending from said vein through the skin of the patient, while said catheter occupies substantially its natural, unstressed shape.

7. The catheter of Claim 6 in which a third curved section of said catheter is defined, in its natural, unstressed configuration, said third bend being positioned between said second curved section and the distal catheter end.

8. The catheter of Claim 6 in which said catheter distal portion is of a length sufficient to permit the positioning of the catheter distal end in the right atrium of the patient's heart while the catheter enters the patient's venous system through the left jugular vein.

9. The catheter of Claim 1 in which said catheter distal portion is of a length sufficient to permit the positioning of the catheter distal end in the right atrium of the patient's heart while the catheter enters the patient's venous system through a jugular vein.

10. The catheter of Claim 1 in which said catheter distal portion is of a length sufficient to permit the positioning of the catheter distal end in the right atrium of the patient's heart while the catheter enters the patient's venous system through a subclavian vein.

11. The catheter of Claim 1 in which a distal portion of said arc angle defining said U-shape of the catheter

defines a second arc angle projecting in the dimension perpendicular to the arc angle of said U-shape.

12. The catheter of Claim 1 in which, in said natural, unstressed configuration, said U-shape defines a central arc angle between a pair of relatively straight terminal catheter sections, the terminal catheter section which is the distal portion of said catheter bending forwardly in the dimension perpendicular to said U-shaped arc angle of the catheter.

13. In the method of simultaneously withdrawing and replacing blood from a patient making use of an implanted catheter, the improvement comprising, in combination, implanting said catheter in the patient with a proximal portion of the catheter extending through a surgically created tunnel and a distal portion of said catheter extending through the venous system of said catheter, with the distal tip of said catheter occupying the right atrium of the heart, said catheter occupying a substantially unstressed, as-manufactured configuration in both said venous system and said surgical tunnel.

14. The method of Claim 13 in which said catheter in its unstressed, as-manufactured configuration is of substantially U-shape with a central catheter arc and a pair

of relatively straight catheter end portions, one of said catheter end portions occupying the venous system of said patient; the other of said end portions occupying the surgically created tunnel of said patient; said catheter penetrating the wall of a vein of said venous system at a position along said U-shaped arc.

15. A catheter for hemodialysis which comprises a flexible catheter tube having a distal end and defining a plurality of separate lumens, said catheter defining a first arc angle in its natural, unstressed configuration, said first arc angle being spaced from the catheter distal end, said catheter also defining, in its natural, unstressed condition, a second arc angle positioned between said first arc angle and said distal end, said second arc angle extending in a direction substantially opposed to the direction of said first arc angle.

16. The catheter of Claim 15 which is proportioned for implantation into the patient through the femoral vein, said catheter being of a length to permit positioning of the distal catheter end in the inferior vena cava, said catheter defining a shape in its natural, unstressed condition which is of the shape of the venous system in which said catheter is implanted.

17. The catheter of Claim 16 in which said first

arc angle is of essentially  $10^{\circ}$  to  $50^{\circ}$ , and extending essentially 50-200 mm., said second arc angle defining an arc of essentially  $20^{\circ}$  to  $50^{\circ}$  and extending essentially 20-50 mm.

18. The catheter of Claim 15 in which said first arc angle is of essentially  $10^{\circ}$  to  $50^{\circ}$ , and extending essentially 50-200 mm., said second arc angle defining an arc of essentially  $20^{\circ}$  to  $50^{\circ}$  and extending essentially 20-50 mm.

*Admitted*